Index 455-101 Series Square CFRP & SS Prestressed Concrete Piles

Design Criteria

AASHTO LRFD Bridge Design Specifications; Structures Detailing Manual (SDM); Structures Design Guidelines (SDG); Fiber Reinforced Polymer Guidelines (FRPG)

Design Assumptions and Limitations

Index 455-101 is the lead standard for the Square CFRP & SS Prestressed Concrete Pile standard series which includes Indexes 455-101 through 455-130. Use this standard with Indexes 455-102, 455-003, 455-112, 455-114, 455-118, 455-124 and 455-130.

Standard piles are designed to have 1000 psi uniform compression after prestress losses without any applied loads to offset tensile stresses that occur during typical driving.

The piles are designed to have 0.0 psi tension using a load factor of 1.5 times the pile self weight during pick-up, storage and transportation as shown in the "Table of Maximum Pile Pick-Up and Support Lengths" on the standard.

Plan Content Requirements

In the Structures Plans:

Show and label the piles on the Foundation Layout, End Bent, Intermediate Bent, Pier, Footing, Typical Section and other sheets as required.

Complete the following "Data Table" in accordance with *SDG* 3.5 and *SDM* 11.4 and include it in the contract plans with the "Foundation Layout" sheets. Modify table and notes as required to accommodate the required number of piles, piers and/or bents, use of Test Piles and instrumentation. When not enough space is available on one plan sheet, continuations of the Data Table and/or separate pile cut-off elevation tables are acceptable. See Introduction I.3 for more information regarding use of Data Tables.

For projects without Test Piles change data table column heading "TEST PILE LENGTH (ft.)" to "PILE ORDER LENGTH (ft.)".

		PILE DATA TABLE										Table Date 01/01/16										
	1.	NSTALLATI	ON CRITE	RIA					Ε	DESIGN CRI	TERIA				PILE CUT-OFF ELEVATIO						NS	
ILE IZE in.)	NOMINAL BEARING RESISTANCE (tons)	NOMINAL UPLIFT RESISTANCE (tons)	MINIMUM TIP ELEVATION (ft.)	TEST PILE LENGTH (ft.)	REQUIRED JET ELEVATION (ft.)	PREFORM	FACTORED DESIGN LOAD (tons)		DOWN DRAG	DECICTANCE	NET SCOUR RESISTANCE (tons)	100-YEAR SCOUR ELEVATION (ft.)	Ø COMPRESSION	Ø UPLIFT	PILE 1	PILE 2	PILE 3	PILE 4	PILE 5	PILE 6	PILE 7	
-																						
IL IZ in.	E E E)	E BEARING RESISTANCE	BEARING UPLIFT RESISTANCE RESISTANCE	BEARING UPLIFT TIP RESISTANCE RESISTANCE ELEVATION	E BEARING UPLIFT TIP PILE RESISTANCE RESISTANCE ELEVATION LENGTH	BEARING UPLIFT TIP PILE JET RESISTANCE RESISTANCE ELEVATION LENGTH ELEVATION	BEARING UPLIFT TIP PILE JET PREFORM RESISTANCE RESISTANCE ELEVATION LENGTH ELEVATION ELEVATION	E NOMINAL NOMINAL MINIMUM 1EST REGULATED REGULATED FACTORES FACTOR	E REMINING UPLIFT TIP PILE JET PREFORM DESIGN UPLIFT RESISTANCE RESISTANCE ELEVATION LENGTH ELEVATION ELEVATION LOAD UPLIFT RESISTANCE RESISTANCE ELEVATION LENGTH ELEVATION ELEVATION LOAD UPLIFT (the)	E BEARING UPLIFT TIP PILE JET PREFORM DESIGN UDWN RESISTANCE RESISTANCE ELEVATION LOAD LOAD LOAD (tons) (tons) (tons) (tons)	E NOMINAL NOMINAL MINIMUM (ES) RECORDED RECOURSED FACTORED DESIGN DOWN RESISTANCE RESISTANCE ELEVATION LENGTH ELEVATION ELEVATION LOAD LOAD (tons) (tons)	E NOMINAL MINIMAL MINIMAL PRIMINION TEST RECORDED RECORDED RESIDENCE DESIGN DOWN TOTAL NET PER BEARING UPLIFT TIP PILE JET PREFORM DESIGN UPLIFT DRAG SCOUR SCOUR SCOUR (tons) (tons) (tons) (tons) (tons) (tons)	E NOMINAL MONINAL MINIMON TEST REGULARED REGULARED TACLORED DESIGN DOWN TOTAL NET 100-TEAR BEARING UPLIFT TIP PILE JET PREFORM DESIGN UPLIFT DRAG SCOUR SCOU	E MOMINAL NOMINAL MINIMUM TEST REQUIRED REQUIRED FACTORED	E MOMINAL NOMINAL NOMINAL MINIMUM TEST REQUIRED REQUIRED REQUIRED REQUIRED RECORD FACTORED FA	E MOMINAL NOMINAL NOMINAL MINIMUM TEST REQUIRED REQUIRED FACTORED	E MOMINAL NOMINAL NOMINAL MINIMUM TEST REQUIRED REQUIRED FACTORED FACE REAL TORSED FOR BEARING BEARING UPLIFT FILE JET REFORM DESIGN (tons) (t	E MOMINAL NOMINAL MINIMUM TEST REQUIRED REQUIRED FACTORED FACE RESISTANCE RES	E MOMINAL NOMINAL MINIMUM TEST REQUIRED REQUIRED FACTORED FACE RESISTANCE BEASING UPLIFT FILE JET REFORM LOAD (tons) (ton	E MOMINAL NOMINAL MINIMUM TEST REQUIRED REQUIRED FACTORED FACTORED PSIGN BEARING UPLIFT FILE JET RESISTANCE (tons)	E MOMINAL NOMINAL MINIMUM TEST REQUIRED REQUIRED FACTORED FACTORED PSIGN DESIGN UPLIFT TIP PILE JET REFORM (tons)	

UPLIFT RESISTANCE - The ultimate side friction capacity that must be obtained below UPLIFT RESISTANCE - The ultimate side friction capacity that must be obtained belt to be used to be

PILE INSTALLATION NOTES [Notes Date 7-01-13]:

Contractor to verify location of all utilities prior to any pile

Minimum Tip Elevation is required for lateral stability.

When a required jetting elevation is shown, the jet shall be lowered to the elevation and continue to operate at this elevation until the pild driving is completed. If jetting or preforming elevations differ from those shown on the table, the Engineer shall be responsible for determination of the required driving resistance.

No jetting will be allowed without the approval of the Engineer.

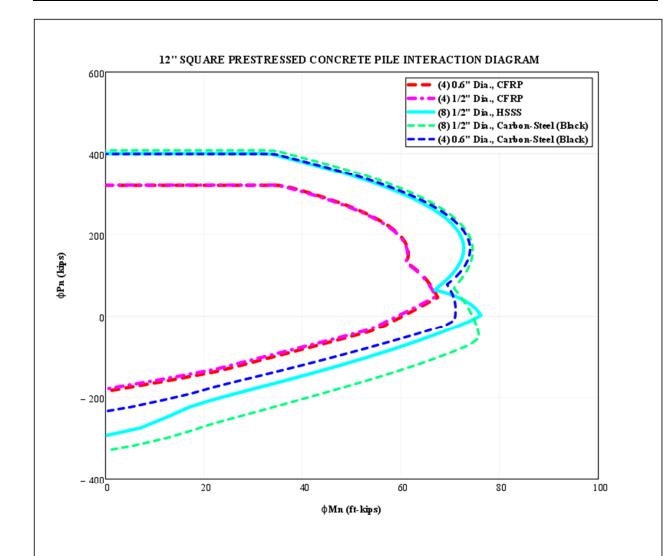
The Contractor should not anticipate being allowed to jet piles below the 100-year scour elevation or required jet elevation, whichever is deeper.

At each Bent, pile driving is to commence at the center of the Bent and proceed outward.

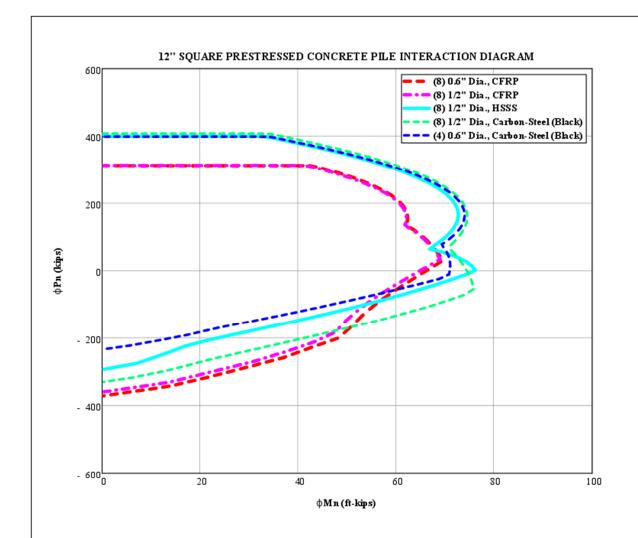
Payment

Item number	Item Description	Unit Measure
455-34-ABB	Prestressed Concrete Piling (CFRP or SS)	LF

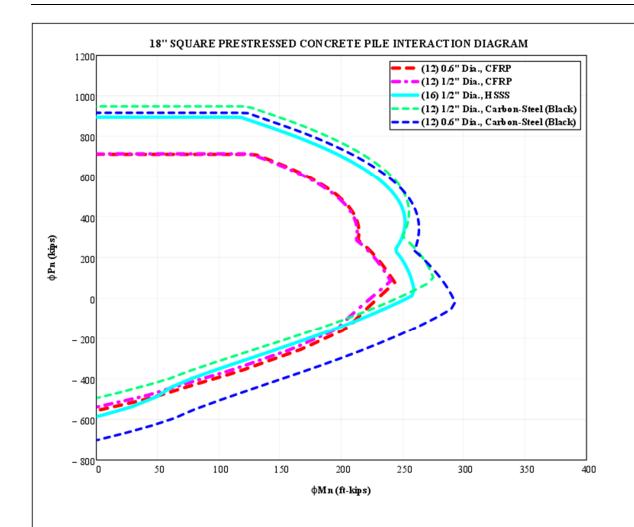
Design Aids



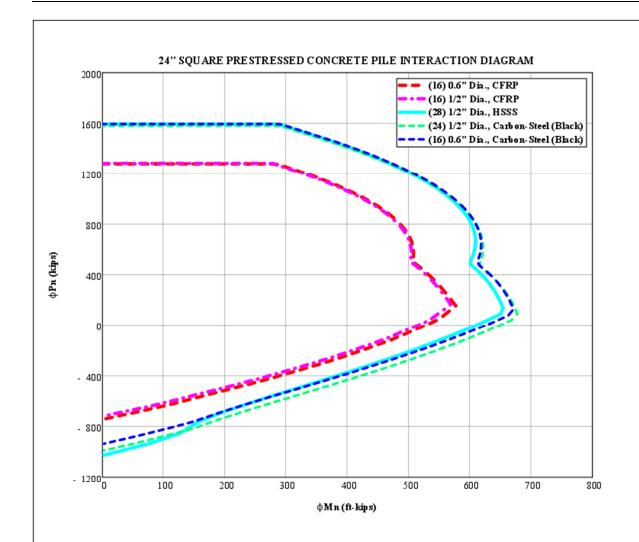
- Concrete compressive strength f_c = 6 ksi.
- Modulus of elasticity of prestressing strands, E_p = 18,000 ksi (1/2" CFRP), 22,480 ksi (0.6" CFRP), 23,500 ksi (HSSS) & 28,500 ksi (Carbon-Steel).
- Resistance factors φ based on ACI 440.4R for CFRP strands (0.05 compression-controlled, 0.85 tension-controlled); and AASHTO LRFD 5.5.4.2.1 for HSSS & Carbon-Steel strands (0.75 compression-controlled, 1.0 tension-controlled).
- All piles assumed to have spiral ties.
- Strand sizes and strand patterns used to create interaction curves correspond with those indicated in Index 455-112 for CFRP & HSSS and Index 455-012 for Carbon-Steel.



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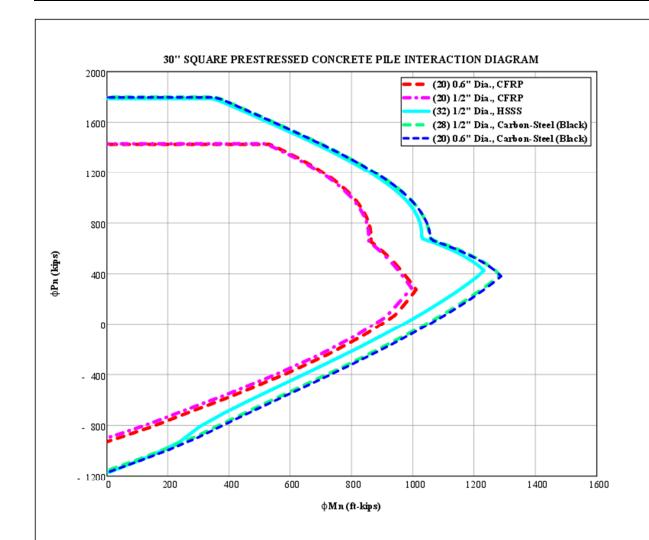


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- All piles assumed to have spiral ties.
- Strand sizes and strand patterns used to create interaction curves correspond with those indicated in Index 455-118 for CFRP & HSSS and Index 455-018 for Carbon-Steel.



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- Resistance factors

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- · All piles assumed to have spiral ties.
- Strand sizes and strand patterns used to create interaction curves correspond with those indicated in Index 455-124 for CFRP & HSSS and Index 455-024 for Carbon-Steel.



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- · All piles assumed to have spiral ties.
- Strand sizes and strand patterns used to create interaction curves correspond with those indicated in Index 455-130 for CFRP & HSSS and Index 455-030 for Carbon-Steel.